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R. G. Burr

S. L. Woodruff

G. R. Banta

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NAVAL HEALTH RESEARCH CENTER
P. O. BOX 85122
SAN DIEGO, CALIFORNIA 92186 - 5122

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ASSOCIATIONS BETWEEN MOOD AND SPECIFIC HEALTH COMPOSITES DURING U.S. NAVY PERSIAN GULF OPERATIONS

RALPH G. BURR, SUSAN I. WOODRUFF and GUY R. BANTA

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Abstract—Previously conducted field studies using shipboard U.S. Navy personnel during at-sea operations in the Persian Gulf have shown that crew members experience mood changes and degradations in general physical health. The objectives of this study were to: (a) examine the relationship between mood and health complaints among personnel deployed in the Persian Gulf; and (b) extend previous research using specific health composites rather than a general measure of health. Mood was assessed for 104 shipboard volunteers using the Profile of Mood States Tension/Anxiety and Fatigue subscales. Health symptoms were measures using the Environmental Symptoms Questionnaire. Results of multiple regression analyses showed that each of 11 distinct health composites was significantly associated with one or both mood variables. Further, the two mood factors were differentially associated with 9 of the 11 health composites. This study underscores the usefulness of employing multiple specific health measures rather than global measures.

INTRODUCTION

RESEARCH on variables associated with diminished health has been prominent in the psychological literature for a considerable period of time. The effect of stress on individual health, for example, is thoroughly documented [1–8]. Another variable thought to spur health complaints is temporary mood [9]. Support for this relationship has been demonstrated in studies consistently showing associations between negative mood and self-reported health symptoms in both clinical and nonclinical populations [10–12]. While the specific mechanisms involved are not yet clear (for a discussion see Croyle and Uretsky), [13], the predominant conclusion from these studies is that negative mood is associated with health symptoms and is probably a causal factor in subjective health appraisals.

The association between mood and health symptoms has received some attention from researchers concerned with military performance in extreme conditions, such as the high heat and humidity found in the Persian Gulf. Previous field studies using shipboard U.S. Navy personnel during at-sea operations in the Persian Gulf have shown that crew members experience mood changes such as psychological fatigue, feelings of confusion, tension/anxiety, and depression, and additionally report degradations in physical health [14–16]. Steele *et al.* [16] studied nine U.S. Navy ships during sustained military operations while cruising the Persian Gulf. The goal of the study was to compare a general measure of total health, as well as 11 specific

Naval Health Research Center, Physiological Performance and Operational Medicine Department, P.O. Box 85122, San Diego, CA 92186-5122, U.S.A.

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health complaints (e.g., mental strain, nasal distress, eye problems) on different types of ships. Steele and colleagues also examined the relationship between two mood measures (Tension/Anxiety and Fatigue) and the general measure of total health and reported a significant correlation. Burr and his colleagues [14] also reported a significant association between Tension/Anxiety and Fatigue mood states and total health symptoms among sailors on two U.S. Navy warships deployed in the Persian Gulf. While both of these investigators documented a relationship between mood and total health symptoms under adverse operational and environmental conditions, neither study considered the relationships between the 11 specific measures of health complaints and the Tension/Anxiety and Fatigue mood measures. The primary extension of this study was to examine the relationship between mood and the 11 specific health complaints among shipboard Navy personnel working in the extreme heat and humidity of the Persian Gulf.

METHODS

Participants

In the summer of 1989, questionnaire data were collected from personnel serving aboard two U.S. Navy ships operating in the Persian Gulf. The first ship, a minesweeper, carried 86 sailors of which 48 (55.8%) volunteered to participate in the present study. The second ship, a miscellaneous command ship, carried 440 sailors of which 56 (12.7%) volunteered to participate. Ship personnel from a variety of watch schedules and occupational specialities were contacted at their work station by a member of the research team and briefed on the purpose of the study, asked to sign an informed-consent form, and, asked to complete the questionnaire. Although circadian cycles were not controlled for, volunteers were from a variety of watches.

The resulting sample ($N = 104$) averaged 25.5 yr of age (SD = 6.2) with a range from 19 to 45 yr. This average age was similar to the mean age (26.2 yr) reported for shipboard men in a Navy-wide random sample [17]. Enlisted personnel (E-1 through E-9; see Appendix A) comprised 93% of the present sample vs 95% of the Navy-wide shipboard sample. The median enlisted paygrade for the present study sample was E-5 (petty officer, second class), again comparable to the Navy-wide sample. These comparisons indicated that the present sample was representative of typical U.S. Navy personnel assigned to ships.

Measures

Mood. Temporary mood was assessed using the Profile of Mood States (POMS), a factor-analytically derived scale measuring six fluctuating mood states: Tension/Anxiety; Depression; Anger; Vigor; Fatigue; and Confusion [18]. In the present study, only the Tension/Anxiety and Fatigue subscales were administered because of the need for brevity and because only those two subscales had been significantly associated with a total health symptoms measure in two earlier studies [14, 16]. The two mood subscales consisted of 16 adjectives to which participants rated their recent experience on a five-point scale ranging from 0 (not at all) to 4 (extremely). Tension/Anxiety mood was measured as the mean of participants' ratings to the following adjectives: tense, shaky, on edge, panicky, relaxed (reversed scored), uneasy, restless, nervous, and anxious. Similarly, Fatigue mood scores were computed as the mean of ratings to the following: worn out, listless, fatigued, exhausted, sluggish, weary, and bushed.

Health symptom composites. Health symptoms were measured using the Environmental Symptoms Questionnaire (ESQ), a 52-item inventory designed to sample subjective reactions and health symptomatology during exposure to extreme environments [19]. Participants rated the severity of each symptom on a scale ranging from 0 to 9, with 0 indicating no current experience with the symptom. Thirty-seven of the 52 ESQ items were organized into 11 specific composites based on previous data reduction procedures in which principal components analyses were used to identify symptom clusters [16]. Scores for the composite symptom scales were created by computing the mean of the items comprising each scale. The resulting composites included Mental Strain, Heat Distress, Muscle Strain, Eye/Sight Problems, Headache, Ear/Hearing Problems, Nasal Distress, Gastrointestinal Distress, Respiratory Distress, Coordination Problems, and Chills. Appendix B shows the specific items that comprised each of the 11 health composites. (For example, the health symptom composite labeled Chills was scored as the mean of the severity score on the items 'My hands feel cold', 'I feel chilly', and 'I am shivering'.) Appendix C presents bivariate correlations and Cronbach's alpha estimates of internal consistency [20]

among the items in each of the 11 health symptom composites and the two mood measures.

Statistical analyses

Multivariate and univariate procedures were used to investigate the association between the two mood measures and 11 health composites. First, Hotelling's T^2, [21] a multivariate analysis of variance procedure was performed to assess the overall association between the mood factors and the health composites. If significant, the Hotelling's T^2 would indicate that subsequent univariate tests were justified because they were based on measures (mood and health) that are related. Next, univariate multiple regression procedures were used to determine the independent contribution of the two mood scales to specific health composites.

RESULTS

The result of the Hotelling's T^2 test indicated (T^2 (22,150) = 1.72, $p = 0.000$) that the two mood variables were significantly related to the 11 health composites, and therefore, a more focused series of univariate analyses were justified. Stepwise multiple regression procedures were used to assess the association between Tension/Anxiety and Fatigue mood states and the 11 specific health composites. Table I presents the results ordered by the amount of variance accounted for by the two mood measures. Explained variance in most of the health composites was quite large (e.g., 47% for Mental Strain and 35% for Respiratory Distress). In other regression equations, the contribution of mood to health was more modest (e.g., 6% for Nasal Distress and 7% for Ear/Hearing Problems).

TABLE I.—RESULTS OF STEPWISE MULTIPLE REGRESSION PREDICTING HEALTH SYMPTOM COMPOSITES FROM TENSION/ANXIETY AND FATIGUE

	R	R^2	R^2Ch	*Beta*
Mental Strain				
Tension/Anxiety	0.6525	0.4258	0.4258*	0.4173*
Fatigue	0.6861	0.4707	0.0449*	0.3165*
Respiratory Distress				
Tension/Anxiety	0.5883	0.3461	0.3461*	0.5883*
Muscle Strain				
Tension/Anxiety	0.5467	0.2989	0.2989*	0.3258*
Fatigue	0.5817	0.3384	0.0395*	0.2971*
Headache				
Tension/Anxiety	0.5527	0.3055	0.3055*	0.5527*
Coordination Problems				
Fatigue	0.4844	0.2346	0.2346*	0.4844*
Gastrointestinal Distress				
Tension/Anxiety	0.4574	0.2093	0.2093*	0.4574*
Eye/Sight Problems				
Tension/Anxiety	0.4392	0.1929	0.1929*	0.4392*
Heat Distress				
Fatigue	0.4262	0.1817	0.1817*	0.4262*
Chills				
Tension/Anxiety	0.3154	0.0995	0.0995*	0.3154*
Ear/Hearing Problems				
Fatigue	0.2675	0.0716	0.0716*	0.2675*
Nasal Distress				
Tension/Anxiety	0.2385	0.0569	0.0569*	0.2385*

*$p < 0.05$.

Tension/Anxiety and Fatigue each made unique contributions to the prediction of Mental Strain and Muscle Strain, with Tension/Anxiety accounting for the majority

of the variance in these variables. Tension/Anxiety alone was associated with Respiratory Distress, Headache, Gastrointestinal Distress, Eye/Sight Problems, Chills, and Nasal Distress. Fatigue alone was associated with three health composites: Coordination Problems, Heat Distress, and Ear/Hearing Problems.

DISCUSSION

Because of the implications of poor health on factors such as physical and cognitive performance, readiness, and morale during conditions of sustained military operations, researchers have sought to examine determinants of health symptoms. Situational stress, for example, has received considerable attention as a contributor to health symptoms. Negative mood has also been identified as an important trigger of health complaints and may have a stronger impact than stressful events [9]. In general, data suggest that the ability to regulate mood is an important requisite for maintaining positive self-appraised health [13].

This study provided further support for the idea of a mood–health link. Moreover, it was found that Tension/Anxiety and Fatigue mood states were differentially associated with 9 of 11 distinct health composites. Results from this investigation point to the usefulness of employing multiple health complaint composites rather than global measures when assessing mood and health associations.

Because investigators have demonstrated that mood states are momentary and can be affected by internal and external influences [22], research in the area may suggest techniques for altering mood, thereby mitigating their associated health symptoms. For example, strategies for reducing fatigue (e.g., providing for adequate periods of sleep and rest, regulation of caffeine consumption, use of motivational techniques) might also result in less severe complaints of coordination problems and heat distress. Likewise, health symptoms uniquely associated with tension and anxiety might be reduced by strategies such as stress management training, exercise, and cognitive/behavioral interventions. Related to this is the recent finding that use of an individual cooling vest during Persian Gulf maneuvers reduced tension/anxiety [15]: to the degree that such a device lessens negative mood, health symptoms may also be positively influenced.

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APPENDIX A

U.S. Navy Enlisted Pay Grades

E1	Recruit
E2	Apprentice
E3	Non rated
E4	Third Class Petty Officer
E5	Second Class Petty Officer
E6	First Class Petty Officer
E7	Chief Petty Officer
E8	Senior Chief Petty Officer
E9	Master Chief Petty Officer

APPENDIX B

Health Symptom Composite Items

Mental Strain	I have trouble concentrating.
	I have trouble remembering.
	I feel worried about something.
	I feel irritable.
	I feel tired.
	I feel sleepy.
	I had trouble sleeping last night.
Heat Distress	I am sweating.
	My hands are sweaty.
	I feel warm.
Muscle Strain	I feel weak.
	My muscles are tense.
	My muscles ache.
Eye/Sight Problems	My eyes feel irritated.
	My eyes are watery.
	My vision is blurry.
Headache	I have a headache.
	My head is throbbing.
	I feel lightheaded.
	I feel nauseous.
Ear/Hearing Problems	I have ringing in my ears.
	My ears are blocked.
	My ears ache.
	I can't hear well.
Nasal Distress	My nose is blocked.
	My nose is running.
Gastrointestinal Distress	I feel stomach pressure.
	I have stomach pains.
	My stomach is upset.
Respiratory Distress	It is hard to breath.
	My breathing seems fast.
	My breathing seems irregular.
Coordination Problems	My sense of balance is off.
	I feel clumsy.
Chills	My hands feel cold.
	I feel chilly.
	I am shivering.

APPENDIX C

BIVARIATE CORRELATIONS AND RELIABILITIES FOR HEALTH SYMPTOM COMPOSITES AND MOOD SCALES

	1	2	3	4	5	6	7	8	9	10	11	12	13
Cronbach's alpha	0.80	0.71	0.84	0.73	0.86	0.70	0.71	0.91	0.93	0.91	0.79	0.89	0.92
1 Mental Strain	—												
2 Heat Distress	0.59*	—											
3 Muscle Strain	0.62*	0.47*	—										
4 Eye/Sight Problems	0.64*	0.45*	0.55*	—									
5 Headache	0.45*	0.41*	0.58*	0.44*	—								
6 Ear/Hearing Problems	0.34*	0.17*	0.35*	0.13	0.26*	—							
7 Nasal Distress	0.23*	0.11	0.22*	0.28*	0.30*	0.16*	—						
8 Gastrointestinal Distress	0.39*	0.45*	0.55*	0.48*	0.68*	0.07	−0.04	—					
9 Respiratory Distress	0.48*	0.37*	0.56*	0.49*	0.69*	0.27*	0.25	0.59*	—				
10 Coordination Problems	0.52*	0.36*	0.50*	0.45*	0.44*	0.35*	0.26*	0.24*	0.37*	—			
11 Chills	0.14	−0.11	0.20*	0.09	0.24*	0.31*	0.12	0.19*	0.27*	0.23*	—		
12 Tension/Anxiety	0.63*	0.36*	0.54*	0.44*	0.55*	0.23*	0.24*	0.46*	0.59*	0.36*	0.32*	—	
13 Fatigue	0.65*	0.43*	0.55*	0.34*	0.43*	0.27*	0.09	0.38*	0.41*	0.48*	0.23*	0.74*	—

*$p < 0.05$.

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Previously conducted field studies using shipboard U.S. navy personnel during at-sea operations in the Persian Gulf have shown that crew members experience mood changes and degradations in general physical health. The objectives of this study were to: a) extend previous research by using specific health complaints rather than a general measure of health; and b) examine the relationship between mood and specific health complaints among personnel deployed in the Persian Gulf. Questionnaire date were collected from 104 volunteers serving aborad two U.S. Navy ships (AGF and an MSO) deployed in the Persian Gulf. Mood was assessed using the Profile of Mood States Tension/Anxiety and Fatigue scales. Health symptoms were measured using the Environmental Symptoms Questionnaire (ESQ). Results of multiple regression analyses showed that each of the 11 ESQ health composites was significantly associated with one or both mood variables; the two mood states differentially predicted 9 of 11 distinct health composites. This study points to the usefulness of employing multiple health composites rather than global measures when assessing mood-health associations.

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